[epsfig]mn

[1] 1 [1] *1* [1] **1** textbfit cmbxti10 textbfss cmssbx10 mathbfit cmbxti10 mathbfss cmssbx10 upmath eurm10 AMSa msam10 0upmath19 0upmath16 0upmath40 3AMSa36 3AMSa3E

normalcmrmit boldcmrbxit [1] 1 [1] 1 [1] 1 normalcmrbxit boldcmrbxit normalcmssbxn boldcmssbxn @mathgroup@group @mathgroup@normal@groupeurmn @mathgroup@bold@groupeurbn @mathgroup@group @mathgroup@normal@groupmsamn @mathgroup@bold@groupmsamn @group19 @group16 @group40 @group36 @group3E

[1] 1 [1] 1 [1] 1 OT1cmrbxit boldOT1cmrbxit OT1cmssbxn boldOT1cmssbxn UPMUeurmn UPMboldUeurbn AMSaUmsamn Γ0*UPM*"19Γ0*UPM*"16Γ0*UPM*"40Λ3*AMSa*"36Λ3*AMSa*"3*E*

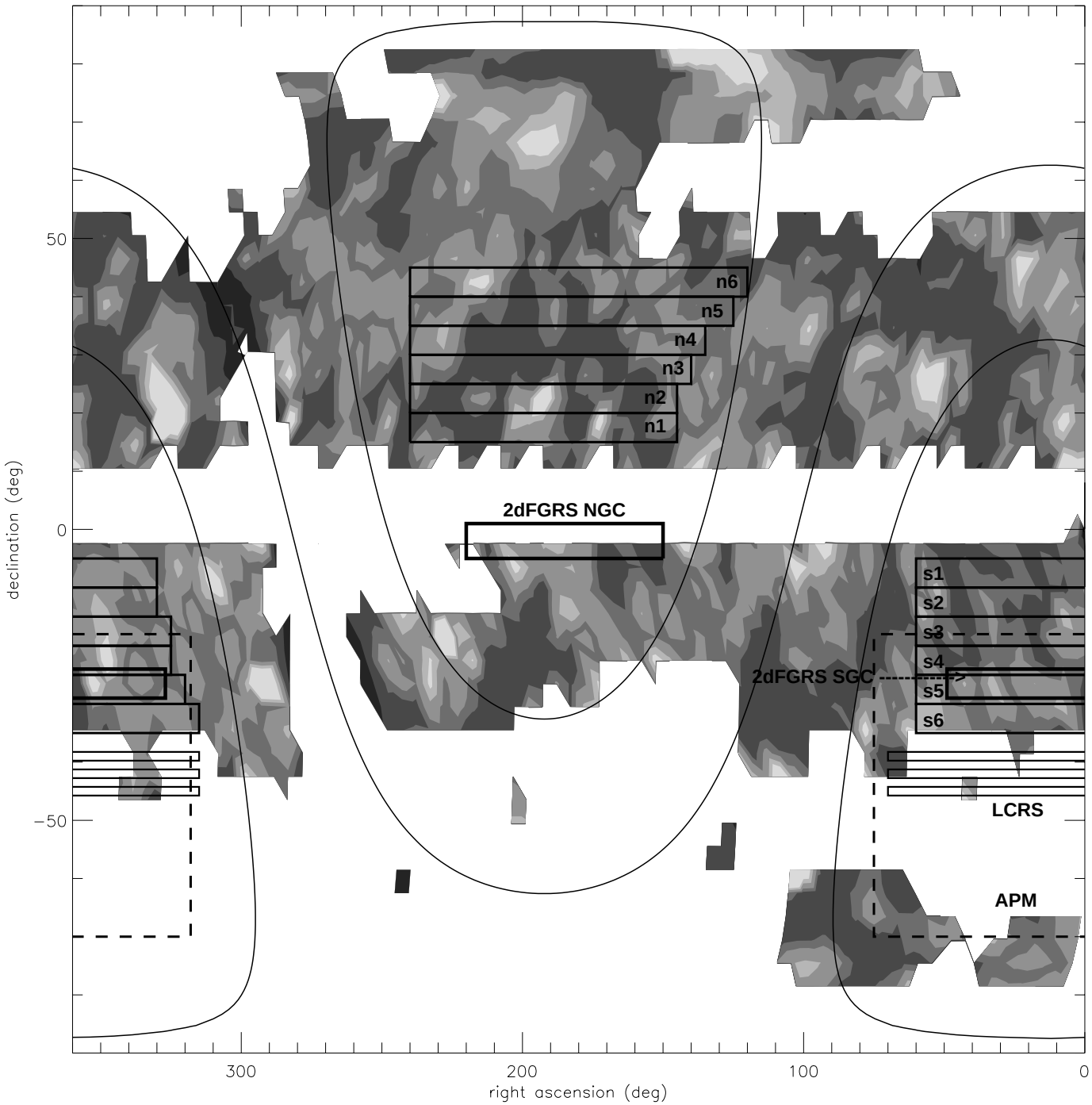
The Local Hole in the Galaxy Distribution: Evidence from 2MASS [W.J. Frith et al.] W.J. Frith, G.S. Busswell, R. Fong, N. Metcalfe & T. Shanks

firstpage–lastpage 2003

document

firstpage

abstract Using the bright galaxy counts from the 2 Micron All Sky Survey (2MASS) second incremental release, two techniques for probing large-scale structure at distances of $\sim 150\,h^{-1}\,$Mpc are investigated. First, we study the counts from two sets of six $5^\circ\times\sim 80^\circ$ strips in the two galactic caps. In the six southern strips a deficit of ~ 30 per cent was found relative to a predicted homogeneous distribution at $K_s \sim 11$. These strips were also in good agreement with a model incorporating the radial density function of the southern 2dF Galaxy Redshift Survey (2dFGRS), which shows a deep underdensity between ~ 90 and $180\,h^{-1}\,$Mpc. Together with a similar underdensity found in the Las Campanas Redshift Survey, these results indicate a very large 'local hole' in the Southern Galactic Cap (SGC) to $\gtrsim 150\,h^{-1}\,$Mpc with a linear size across the sky of $\sim 200\,h^{-1}\,$Mpc $but with a significantly lower mean underdensity of \sim$30 per cent than that suggested by the bright APM SGC counts. The counts in the northern set of strips are low overall but indicate a more varied pattern. When all the available 2MASS data with $|b| > 30^\circ$ were aggregated, they indicated underdensities of ~ 18 per cent and ~ 30 per cent at $K_s \sim 11$ for the northern and southern areas respectively. Our second method uses the ratio of the counts with $11.38 < K_s < 12.38$ to $12.88 < K_s < 13.38$ binned in 25 deg^2 areas; the counts from these areas provide a smoothed map over the sky of the slope in the counts between K_s=11.38 and 13.38. Visually, the resulting map shows the expected complex form of the cosmic web and picks out known rich clusters, demonstrating the usefulness of this 'slope statistic' as a probe of large-scale structure at distances of $\lesssim 150\,h^{-1}\,$Mpc. Most interestingly, the map also shows large regions, $\sim 100^\circ$ across, of steep counts in both hemispheres. Thus, the present 2MASS data suggest the presence of a potentially huge contiguous void stretching from south to north. Not only would this delineate further the limits for the Cosmological Principle but it would also show the possible presence of significant power on scales of $\gtrsim 300\,h^{-1}\,$Mpc in the galaxy power spectrum.


n6
n5
n4
n3
n2
n1
2dFGRS NGC
s1
s2
s3
s4
2dFGRS SGC
s5
s6
LCRS
APM
50
0
−50
declination (deg)
300
200
100
0
right ascension (deg)